Packaging machine and method for paperboard cartons

FIELD OF THE INVENTION

The present invention relates to packaging of primary articles such as bottles into secondary containers such as cartons. It is particularly concerned with a method and apparatus for ensuring that preformed collapsed paperboard cartons, termed "flats", which are generally erected or set up to form cartons in a bottling facility and which are then transferred to the next workstation in the packaging process are in a fully open condition.

BACKGROUND OF THE INVENTION

Article packaging machines are well known and readily commercially available. Such machines are widely used, for example, in the beverage industry by brewers, soft drink manufacturers and the like to accomplish the packing of primary containers such as bottles, cans, etc. of beverages into secondary containers, namely cartons, made of corrugated cardboard, paperboard or a similar strong paper product. The erected cartons are generally produced *in situ* in the packaging facility from blanks which, typically, have a plurality of co-planer walls, panels and flaps that are separated by fold lines. Such flats are delivered to the user in that form because they are easy, convenient and less costly to ship and store in the packaging facility. The user in turn sets them up into the required three-dimensional, usually rectangular, configuration with an opening to receive a complement of primary containers. This step is usually effected by means of automatic devices following their delivery from storage. Examples of such machines are disclosed in U.S. 3,956,976; 5,411,464; 4,571,916 and 6,050,063. Following being set up, they are subject to further processes, for example,

being filled with articles such as bottles. Various types of devices are employed for filling the erected containers. Many of these involve "top loading", i.e. the carton contents are dropped through the open top of the container after the container bottom has been formed. The dropping method can be unreliable and cause problems because many of the primary articles can fall out of position, especially if the path into the carton is in any way hindered. To be effective, the carton has to be packed carefully and with precision especially when, as in the brewing industry, the length and breadth dimensions of the carton, and therefore of the opening through which the primary articles must pass, are only marginally larger than that of the block or "unit" of bottles being inserted, since the cartons are designed to prevent movement of enclosed bottles. Any obstacle to the insertion of the articles is therefore a significant problem.

In addition, in erecting the carton, the closure top flaps, which comprise the top of the carton following filling and sealing, must initially be spread outwardly, i.e. away from the open top so that they do not interfere with the insertion of the articles into the erected empty carton. It will be appreciated that the complement of the articles, e.g. bottles, say 6 or 12 being top loaded into the open carton constitute a rectangular "unit" of having a configuration of say 2 x 3; 2 x 6 or 3 x 4, bottles. Any obstruction to the insertion of the assembled "unit" into the proposed carton results in an inability to insert the unit and disruption of the high speed filling line which then has to be shut down with severe economic implications. Possible problems with the flaps is usually effected using cams or similar tools – refer for example to U.S. 3,956,976. However, there are still problems, many of which relate to the characteristics material, such as paperboard, from which the cartons are made. In particular, at certain times of the year, the carton material can loose moisture and, when the carton has been set up, the top flaps have a tendency to "bow" out or buckle out of shape and thereby partially extend

across and obstruct the opening into the empty carton. This interferes with the loading of the carton, the serious consequences of which are detailed above.

It is an object of the present invention to provide a device and a method to ensure that the closure flaps of an erected carton do not obstruct the carton opening thereby preventing clear insertion of articles into the carton.

STATEMENT OF INVENTION

It has been found that providing moisture to the flaps of an erected carton prior to it reaching the next processing station in a packing line corrected any tendency of the flap to distort, for example, bow or buckle, and thereby hinder or prevent the next step or stage in the packing process from being successfully effected. In particular, a carton closure flap which, because of distortion due to dryness, buckles and overlaps the opening in the carton thereby hindering or totally preventing entry of the complement of articles to be packed into the carton, when moistured, quickly adopts its original and generally planner condition lying outside the area of the carton opening to allow said articles to be inserted into the carton without hindrance.

The present invention can be used to advantage in the packing of paperboard cartons, such as end loaders but especially of the top loading type where obstruction of the carton opening by distorted closure flaps can be a problem.

It should be noted that the carton flaps should be treated with sufficient moisture to correct the buckling caused by dryness but insufficient to over wet the carton. If the carton material remains wet for a prolonged period, which might result from over wetting, there may be a tendency for mold to form, a highly undesirable event. Also, excessive wetness could result in the wet carton material tearing. The actual amount of moisture required is readily determined by simple experiment. The take up or absorption of the moisture by the board

material, especially paperboard material is quite rapid and so is the correction of the way or distortion, i.e. its reversal to its original position of the board material.

Obviously, the present invention has application in any situation where generally secondary, but also primary, cartons used in a packing operation encounters the same drying out problem as outlined above. Hence, end and side loading carton filling operations; the packaging of other food and non-food articles; and the like can all benefit by use of the present invention.

The moisture can be applied in a mist or spray using known spray heads.

In one embodiment therefore, the present invention provides a method of treating a paperboard container at least part of which is distorted by dehydration which adversely affects its use for its intended purpose, comprising applying to the distorted portion of said carton moisture which when absorbed, is sufficient to co-interact said distortion and render same ineffectual.

A special application of the present invention is when the carton is in an erected condition having sealing flaps distorted through dehydration so as to overlie the opening through which the product is inserted into the carton. Said flaps are treated with moisture, which upon absorption by the flaps counteracts said distortion thereby ensuring access to the carton for the products.

The cartons to be filled may be of the type having a pre-glued bottom flaps and a locking system which engages when the collapsed carton is fully open or erected thereby holding the carton open so that articles can be inserted past spread outwardly extending flaps. The carton is then transported to an article loading machine which introduces the articles such as bottles, into the open carton and, subsequently, causes rotation of said flaps to overlie the articles in an abutting relationship where they are secured together by, for example, hot melt adhesive to seal the carton.

According to a further embodiment, the present invention there is provided a form, fill and seal packaging machine adapted to receive a carton flat having sealing flaps susceptible to warping when dehydrated, erect the carton flat into an open carton, fill and seal the open carton, the machine comprising a frame means for erecting the carton blank into a carton having an opening, closurable by said sealing flaps, for the insertion of articles; means for moistening the sealing flaps to counteract or prevent any warping of said flaps which would hinder insertion of said articles into said carton; means for filling said carton with a complement of articles; means to manipulate said flaps to overlie said articles; and means to secure said flats together to seal said carton.

According to yet a further embodiment of the present invention, there is provided a method for packing articles into a carton, said process comprising manipulating a carton flat having flaps adapted to seal an opening into the carton into an erected open condition, moisturizing any warped closure flaps to negate said warp during transport of said carton to a packing station where it is filled by inserting a complement of articles through said opening into said container, manipulating said flaps so that they overlie the articles in the carton and securing the flaps together to seal the carton.

DRAWINGS:

The present invention will be described, but not limited by, reference to the accompanying drawings in which:

FIGS. 1 to **4** show stages of set up of a top loading carton flat – shown in **FIG. 1** – to the erected open carton – shown in **FIG. 4**.

FIG. 5 is an angled perspective of an erected carton with its top side closure flaps distorted.

FIG. 6 is a top plan view of the carton of **FIG. 5**.

FIG. 7 is a schematic drawing showing of a packaging line showing the route taken by a carton during a packaging operation.

FIG. 8 is an angled perspective from above and a side of a hydrating station according to the present invention.

FIG. 9 is an angled perspective from above and a side of part of the conveyor system which transports erected cartons to a packer.

In the drawings, a top loading carton, generally designated 27 has side walls 1 and 5; end walls 2 and 6; top side closure flaps 3 and 4 and top end closure flaps 7 and 8. **FIG. 4** shows how the top closure panels 3, 4, 7 and 8 are generally oriented in the open erected carton 27. **FIG. 3** shows how the bottom wall, generally designated 9, is formed from sections 10, 22, 12 and 13.

Side wall 1 is foldably interconnected at 16 with end wall 2 and side wall 5 is foldably interconnected with end wall 6 at 17. The bottom wall 9 is a composite of the numbered bottom wall sections 10, 11, 12 and 13 hinged to the lower edges of the side and end walls. The bottom wall sections include section 10 foldably connected to the bottom edge of side wall 5; section 11 foldably joined to the bottom edge of end wall 6; section 12 foldably joined

to the bottom edge of side wall 1 and section 13 foldably connected to the bottom edge of end wall 2.

A securing flap 11 is foldably joined to the bottom edge of end wall 6 and is secured in place in contacting relation to section 12 and these overlapping panels include coinciding diagonal fold lines. A further securing flap 13 is foldably joined to the bottom edge of end wall 2 and is secured in place contacting relation to section 12 and these overlapping sections include coinciding diagonal fold lines. When a collapsed carton 26 is pressed inwardly at joints J it is converted from the collapsed condition shown in **FIG. 1** to where the carton walls form a rectangle in cross-section (refer **FIG. 4**); the diagonal fold lines are positioned in general alignment with each other and notches 14 and 15 formed on the edges of sections 10 and 12 become interlocked to secure the carton 27 in its erected condition shown in **FIG. 4**. It may be noted that the sealing flaps 3, 4, 7 and 8 are spread outwardly so that they do not interfere with the insertion of product into the erected or expanded carton. As indicated in the sequence shown in **FIG. 1** to **FIG. 4**, the flat or collapsed carton 26 of **FIG. 1** is first converted to the position shown in **FIG. 2** due to movement toward the right of side wall 1 whilst maintaining side wall 5 in its original position. This relative movement continues until the carton 27 attains the position shown in **FIG. 4**. Of special note is the planer character and orientation of top closure flaps 3, 4, 7 and 8 each of which in the flat carton was originally in a plane including its associated side or end wall to which they are attached via hinge lines 18 and 19 each flap being angled out of the plane including its associated side wall and away from carton opening 20. Consequently, the opening 20 of carton 27 is not obstructed by any of the top closure flaps 3, 4, 7or 8. This is the situation required for successful filling and efficient operation of the packaging line. Erection of the carton 10 can be effected using a number of commercially unavailable machines such as that described for example in U.S. 5,411,464 mentioned above.

The plane characteristic or condition of the top flaps are shown in **FIG. 4** is the ideal one. The exaggerated condition of the top flaps as shown in **FIGS. 5** and **6** is, however, not an unusual one especially in drier seasons such as during a Canadian winter. As can be seen, the larger side top closure flaps 3 and 4 are distorted or buckled bow inwardly taking up a position overlying part of the opening 20 of container 27. This is usually attributable to the flaps becoming dehydrated to some degree during storage. In any event, attempting to drop load a rectangular "unit" comprising a full complement of six (in a 2 x 3 configuration) beer bottles into the container shown in **FIG. 6** would not be successful. The unit jams against the flaps 3 and/or 4 casing one or more bottles to fall over, etc.

FIG. 7 illustrates in schematic form, the overall inventive packing process. Flats from storage arrive via conveyor 21 at the carton erection or set-up station 22. Following being set up they are transported to, and through, a moisturizing or hydrating station 23 and on to the bottle packer 24. Following being packed with a full complement of filled bottles of beer and sealed, the package is further transported to a palletizer 25. Finally, the pallets loaded with the retail beer packs are moved to storage.

Turning to **FIG. 8**, this illustrates a hydrating station, generally designated 23, of the present invention. The station 23 comprises in combination a carton support, in this case a section 31 of a conveyor 32, and a hydration system, generally designated 33 comprising a water delivery tube 34 which also carries and supports a moisturizing head 35. Head 35 has two nozzles 36 each angled laterally to the direction of travel of the carton 27 and arranged to direct a fine water mist or spray in a vertical line sufficient to apply moisture to substantially all of the inside surface 30 of each carton side top flap 3 and 4 as they are transported through the station. Tube 34 is secured to guide rails 38 and 39 via clamps 40 and is connected to a source (not shown) of pressurized water.

It should be noted that top end flaps 7 and 8 are note shown in full in **FIGS. 8** and **9.** These flaps are relatively small in this carton and hence distortion is not a significant problem and, as a practical matter, can usually be ignored. If necessary, however, those flaps could also be similarly moisturized by providing additional spray nozzles 36 or separate additional spray heads 35.

Following being treated, carton 27 continues along conveyor 32 and during this time, treated top side flaps 3 and 4 absorb the applied moisture and regain their original and desired planer characteristic as shown in **FIG. 9.** Note that the total open area or opening 20 of the carton top is then unobstructed by the top flaps 3 and 4. This occurs quite quickly and hence the distance between the hydrating section 31 and the packer 24 can be relatively short and not take up much floor space.

To summarize the operation of the device of the present invention, the carton 100 having distorted top closure flaps 3 and 4 is, following having been set up at the erector 22, is transported via conveyor 21 through hydrating station 23 where substantially all of the interior surface 30 of each of top side closure flaps 3 and 4 are subjected to a fine spray or mist of water (indicated by the dotted lines) in **FIG. 8.** The carton 27 then exits the hydrating station 23 and is transported to top loading bottle packer 25. During the time of transport between those stations, the moisture is taken up by the top side closure flaps 3 and 4 which regain their original planar condition prior to reaching packer 24. Consequently, any tendency of the flaps 3 and 4 to obstruct carton opening 20 is removed and the carton 100 is successfully packed and sealed at the packing station. As a practical matter, all cartons 100 travelling on the conveyor are treated with the spray to ensure all those dehydrated and requiring treatment do receive it.

It may be noted that this treatment does not adversely affect the usual carton sealing method, that is, the use of hot melt adhesives since the hot glue is not affected by moisture.

The present invention can, of course, be used to advantage in any situation where a carton opening is restricted or obstructed by overly dry closure flaps. Consequently, if could be used in association with side or end-loading operations as well as the packaging of other food or non-food articles, yogurt containers or plastic utensils.